APPENDIX 5.5A

Transportation of Ammonia Risk Analysis

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Anhydrous ammonia will be transported to the project site using U.S. Department of Transportation (DOT) approved tanker trucks. However, the transportation of ammonia, and any other hazardous material, poses a risk of exposure to the surrounding population due to an accidental release caused by a traffic accident involving the delivery vehicle.

An ammonia leak occurring during delivery of the material to the LEC storage tank could result in hazardous ambient concentrations in the immediate vicinity of the release. The impact of this accidental release would depend upon the location of the release relative to the public. The possibility of accidental release during delivery depends upon the following factors which are reflected in the accident statistics:

- Skill of the drivers
- Type of vehicle used for transport
- Traffic conditions or road type

Because of the potential impact on the public, there are extensive regulatory programs in place in the United States and California to ensure safety during the transportation of hazardous materials, see the Federal Hazardous Materials Transportation Law (49 U.S.C. § 5101 et seq.), the US Department of Transportation Regulations (49 C.F.R. Subpart H, § 172-700), and California DMV Regulations on Hazardous Cargo (CCR, Vehicle Code, § 34000). These regulations also address the driver's abilities and experience. Because of these regulations, the CEC staff only focuses on the potential for an incidence after the delivery vehicle has left the main highway.[1] Therefore, the following analysis focuses on the non-highway delivery routes due to the greater potential for accidents to occur on non-highway roads.

Transportation Probability Analysis

Technical and scientific literature on hazardous materials transportation was reviewed for accident rates in the United States and California in performing this transportation probability analysis for the delivery of ammonia to LEC. The following references were used to prepare this hazardous materials transportation probability analysis:

Davies, P.A. and Lees, F.P. 1992. "The Assessment of Major Hazards: The Road Transport Environment for Conveyance of Hazardous Materials in Great Britain." Journal of Hazardous Materials, 32: 41-79.

[1] See Hazardous Materials Management section of the Final Staff Assessment for the Contra Costa Power Plant Unit 8 (00-AFC-1), March 2, 2001.

Harwood, D.W., Viner, J.G., and E.R. Russell. 1993. "Procedure for Developing Truck Accident and Release Rates for Hazmat Routing." Journal of Transportation Engineering. 119(2): 189-199.

Vilchez, J.A., Sevilla, S., Montiel, H., and J. Casal. 1995. "Historical Analysis of Accidents in Chemical plants and in the Transportation of Hazardous Materials." J. Loss Prev. Process Ind. 8(2): 87-96.

National Response Center (www.nrc.uscg.mil)

Chemical Incident Reports Center, U.S. Chemical Safety Board (www.chemsafety.gov)

National Transportation Safety Board (www.ntsb.gov)

Data presented in the 1992 Davies and Lees study (which uses data from the 1990 Harwood study) identifies the frequency of hazardous materials release during transportation as between 0.06 and 0.19 releases per million miles traveled on well-designed roads and highways. The study presented data for the three dominant road types: urban freeway, rural freeway, and two-lane rural road. The reported frequencies of hazardous materials release during transportation per million miles traveled were 0.06 (urban freeway), 0.14 (rural freeway), and 0.19 (two-lane rural road). The Davies and Lee study also estimated the probability of an incident randomly occurring in an area where a large number of people would be exposed. This analysis estimated that 8.9 percent of such incidents would cause more than 10 fatalities and 1.4 percent would cause more than 33 deaths. These statistics do not include any mitigating effects from meteorological conditions (such as wind) that would help disperse the ammonia, thus reducing the potential impacts.

The Applicant estimates the annual number of ammonia deliveries to be a maximum of 24 per year (2 deliveries per month X 12 months). Each ammonia delivery truck will travel approximately 3.08 miles from the Interstate 5 off-ramp to the plant site. Therefore, the estimated annual distance the loaded ammonia delivery trucks will travel on this section of roadway is 73.9 miles (3.08 miles x 24 deliveries).

To be conservative in this analysis, the Applicant selected the two-lane rural road value, which has a higher risk rate than an urban truck route. Using the data presented in Davies and Lees for the reported frequency of a hazardous material transportation-related release of 0.19 releases per million miles of rural road traveled and the estimate that 8.9 percent of the incidents would cause more than 10 fatalities, the risk of an accident causing more than 10 fatalities is 0.017 per one million tanker miles traveled (0.19 releases per million miles x 0.089 accident rate). Since the distance traveled is 73.9 miles per year, the risk of an incident occurring during the year that would result in 10 or more fatalities is 0.017/million miles x 73.9 miles, or 1.26 in one million.

The risk of an accident occurring that would result in more than 33 deaths is even smaller. Using the Davies and Lee data, the probability is 0.19 releases per million miles of rural road traveled and the estimate that 1.4 percent of the incidents would cause more than 33 fatalities; the risk of an accident causing more than 33 fatalities is 0.0027 per one million tanker miles traveled (0.19 releases per million miles x 0.014 accident rate). Since the distance traveled is 73.9 miles per year, the risk of an accident occurring in any year that

would result in 33 or more fatalities is 0.0027/million miles x 73.9 miles, or 0.20 in one million.

The CEC uses a significance threshold of 1 in 100,000 (or 10 in 1,000,000) for a risk of 10 fatalities and a threshold of 1 in 1,000,000 for a risk of 100 fatalities[2]. Both of the project's risk estimates (1.26 and 0.20 in one million) are well below these thresholds. Therefore, the risk of exposure to aqueous ammonia during transport to the plant site is not significant.

[2] See Hazardous Materials Management section of the Final Staff Assessment for the Contra Costa Power Plant Unit 8 (00-AFC-1), March 2, 2001.